Digital Digest

Vol. 2 No. 3 **Devoted entirely to Digital Amateur Radio Communications** May/June 1989

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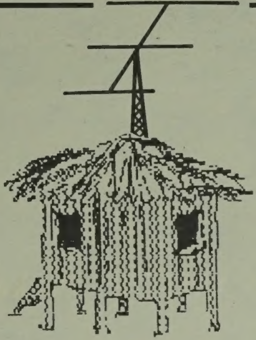

From The Publisher's Shack

This could be termed "first issue AD" (After Dayton)... It is almost embarrassing to say that after being a ham for 28 years, 1989 was my first experience... and I thought the Orlando Hamcation was big!!

The rain, which pummeled Dayton for a good part of the ham weekend, seemed to have little effect on dampening the spirits of all who trekked their way from the four corners of the earth to see what's new (or old, for that matter), in Amateur Radio. For a weekend, Dayton again played host to being what could possibly be termed the "biggest ham radio candy store." *(cont'd on page 3)*

Connect your computer to a new world of adventure . . .

AMATEUR RADIO!

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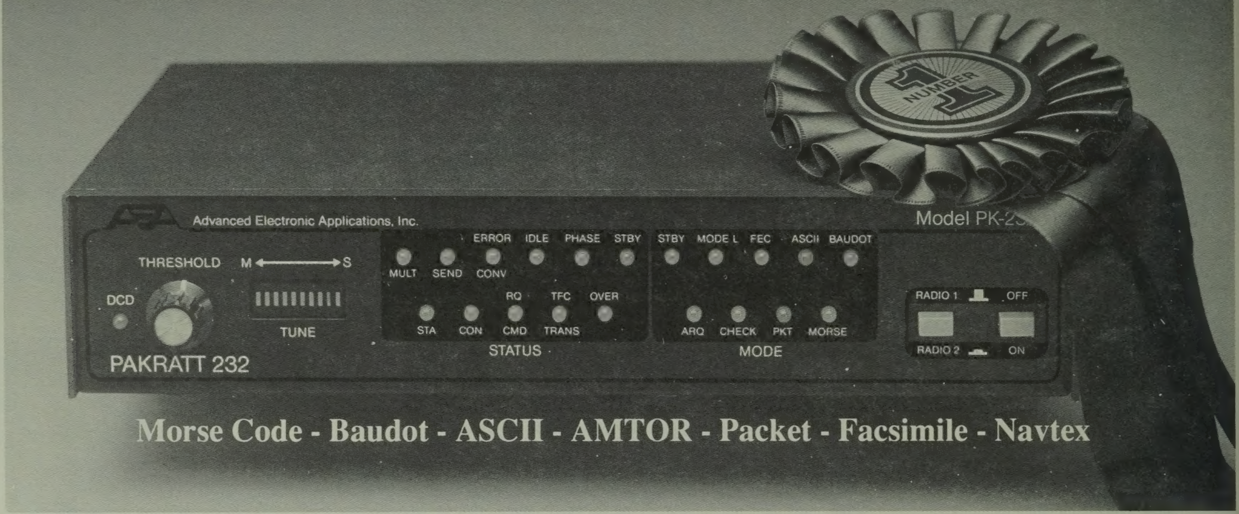
Others May Try to Imitate, But...

Only One Can Be The Best



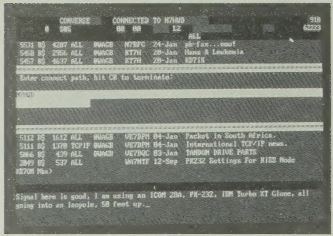
Morse Code - Baudot - ASCII - AMTOR - Packet - Facsimile - Navtex

It's a lesson you learn very early in life. Many can be good, some may be better, but only one can be the best. The PK-232 is the best multi-mode data controller you can buy.

1 Versatility

The PK-232 should be listed in the amateur radio dictionary under the word Versatile. One data controller that can receive seven digital modes, and can be used with almost every computer or data terminal. You can even monitor Navtex, the new marine weather and navigational system. Don't forget two radio ports for both VHF and HF, and a no compromise VHF/HF/CW internal modem with an eight pole bandpass filter followed by a limiter discriminator with automatic threshold control.

The internal decoding program (SIAM$^{tm)}$ feature can even identify different types of signals for you, including some simple types of RTTY encryption. The only software your computer needs is a terminal program.



```
        CONVERSE      CONNECTED TO N7HWD                          918
     0  985              00  00         12                      62223
                                          ALL
5531 B$  4287 ALL    0WAGB    N7BFC  24-Jan  pk-fax...now!
5458 B$  2956 ALL    0WAGB    KT7H   20-Jan  Hans & Leukemia
5457 B$  4637 ALL    0WAGB    KT7H   20-Jan  KD7IK
Enter connect path, hit CR to terminate:
N7HWD
5112 B$  1612 ALL    0WAGB    VE7DPM 04-Jan  Packet in South Africa.
5111 B$  1378 TCPIP  0WAGB    VE7DPM 04-Jan  International TCP/IP news.
5046 B$   439 ALL    0WAGB    VE7DQC 03-Jan  TANDON DRIVE PARTS
2849 B$   537 ALL             WA7NTF 12-Sep  PK232 Settings For KISS Mode
KE7OM Msg>
Signal here is good, I am using an ICOM 28A, PK-232, IBM Turbo XT Clone, all
going into an Isopole, 50 feet up._
```

PC Pakratt Packet TX/RX Display

Facsimile Screen Display

2 Software Support

While you can use most modem or communications programs with the PK-232, AEA has two very special packages available exclusively for the PK-232....PC Pakratt with Fax for IBM PC and compatible computers, and Com Pakratt with Fax for the Commodore 64 and 128.

Each package includes a terminal program with split screen display, QSO buffer, disk storage of received data, and printer operation, and a second program for transmission/reception and screen display of facsimile signals. The IBM programs are on 5 1/4" disk and the Commodore programs are plug-in ROM cartridges.

3 Proven Winner

No matter what computer or terminal you plan to use, the PK-232 is the best choice for a multi-mode data controller. Over 20,000 amateurs around the world have on-air tested the PK-232 for you. They, along with most major U.S. amateur magazines, have reviewed the PK-232 and found it to be a good value and excellent addition to the ham station.

No other multi-mode controller offers the features and performance of the PK-232. Don't be fooled by imitations. Ask your friends, or call the local amateur radio store. We're confident the PK-232 reputation will convince you that it's time to order your very own PK-232.

Call an authorized AEA dealer today. You deserve the best you can buy, you deserve the PK- 232.

Advanced Electronic Applications, Inc.
P.O. Box C-2160
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206-775-7373

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The DIGIPEATER

News & Information communicated from various sources.

★★★★★★★★★★ From The Publisher's Shack ★★★★★★★★★★

(cont'd from front page)

Most all of us can relate to those days of our childhood when we would goo-goo and gaah-ga over something that caught our eye at the "Five & Dime." At Dayton, there were all those same childhood cravings... only the "candy" now translates into radio gear and computers, all requiring a few more dimes to acquire! Even though (much to the surprise of my XYL, Carol), I managed to keep the wallet from going into a highly deflated state, it was still exciting to "window-shop" and to gaze at all the goodies.

With each amateur hamfest, there seems to be a greater proliferation of compuers, software and related accessories which was no less evident in Dayton. The split seemed to be pretty close to 50/50 with amateur vs. computer dealers. More evidence that the computer is gaining ever more acceptance in today's ham shack. For many of us, it is becoming more difficult to even remember what life was like in the ham shack prior to the arrival of our keyboard and monitor.

Many of the mundane functions of amateur operation have been streamlined, improved, made more tolerable, and even fun with the addition of the computer to the shack. Contesting, logging and QSLing are a few of those activities. Add to this, new means of communication, like Packet and AMTOR, which were not possible prior to the computer.

The computer has opened many new opportunities in amateur radio and digital communication. Much of the show at Dayton hinged in some way on the computer and the new micro-technologies now embedded into almost all phases of our hobby. Most of us who are hams today, started our digital communication sending dits & dahs with vacuum tube rigs. We are now adding the computer and enjoying new modes of digital communication with 'chirps'... 'brrraaps' and so on.

One opportunity we have at increasing our ham ranks is by spreading the word to our computer hobbyist friends of the many adventures to be had in amateur radio. Part of what we hope to accomplish with Digital Digest, is to help get those computer hobbyist now connected to telephone modems and landlines... connected to TNC's, transceivers and antenna's. Basically, a reverse situation. Where we began with a radio, and connected a computer; we hope to get those who have started with a computer connected to amateur radio.

The "Code/No-Code" controversy notwithstanding, the opportunities are there to advance our ranks regardless of the outcome. Happily, Digital Digest is gaining interest and support from both the amateur and computer communities and hopefully we will achieve the results of helping to contribute to the knowledge and growth of our hobby. With this thought in mind, if any of our readers have non-amateur, or amateur friends who you believe might enjoy receiving a copy of the Digest, we will send them a complimentary issue, just let us know.

For my closing comments, I would like to take this opportunity to thank all of you; our subscribers, columnists and advertisers for the support you have given the Digest. We appreciate all the input, comments and suggestions which have been both constructive and reassuring. With each passing issue, we hope to build and maintain a high level of quality in a continued effort to retain your support and confidence... so please keep your comments, suggestions, news items, articles, etc. coming!

73's... Tom, WA8DXD

SUPEREASY MORSE for the PC...

is a new addition to a long list of productivity programs developed and/or distributed by BAHRNO Products for the amateur radio market. The Morse learning program was developed specifically for the IBM PC and compatibles using MS-DOS 2.0 or higher.

SUPEREASY MORSE will calibrate and vary speed from 0 to 99 wpm, tone, and spacing. Sends letters, numbers, punctuation, prosigns and traditional learning groups as individual characters or groups, randomly or from your keyboard or a personally developed file.

A quiz function tests recognition, calculates score, and remembers problem characters for further exercise. Library generates amateur words, ham words, call signs, DX call signs, and hundreds of hours of QSO's. Time of sending can be used to simulate test.

SUPEREASY MORSE is available for $12.00 + $2.00 P&H from:
BAHRNO Products, 2535 Marietta Street, NE, Palm Bay, Florida 32905
Ph: (407) 768-2261
Write to the address above for a free catalog describing the wide selection of amateur productivity software.

New SSTV & FAX System for the Commodore AMIGA...

Advanced Electronic Applications (AEA) and Black Belt Systems announce a fully integrated system that utilizes the unique capabilities of the Amiga computer for transceiving facsimile and slow-scan TV.

AVT (Amiga Video Transceiver) Master offers FM facsimile features such as start signal and phasing on transmit and one-shot autostart and autophase on receive. Rates of 60, 120 and 240 lpm are supported as well as 400, 800 and 1200 line receive. Each line has 1024 pixel resolution with 16 gray levels. The AVT Master allows real-time gray level control with user defined demodulation curves allowing specified areas of the image to emphasize ground details without altering cloud formations. Received images can be printed on any Amiga printer or saved to disk files for further enhancement. You can also send rotated, flipped and negative images.

AVT Master will copy any mode of SSTV that's on the air! The unique AVT modes are only 400 Hz wide and are immune to color/luma shifts. AVT modes can cut through the QRM and QRN that have always plagued previous SSTV modes. You can convert from one SSTV format to another, zoom, synthesize scan lines, reposition lines horizontally, or reposition R, G & B buffers vertically. Of course, you can overlay text in any font with full preview and "undo" capability. Any screen can be "grabbed" for transmission or saved to disk.

AVT Master gives new meaning to the term "user friendly." Full color control panels give you full access to such features as a simulated tuning scope, setting Amiga output levels and the low pass filter, and selecting any of five audio inputs. You can send color or black and white images over the phone lines to similarly equipped AVT Master systems. There's telephone ring detect, auto answer and much more.

The AVT Master will run on any Amiga with a minimum of 1 Megabyte of memory. It consists of all hardware, software, cables and documentation required to turn your station into what just might be the finest SSTV/FAX system available today!

AVT Master is scheduled for release this Summer.

For the more information please contact:
Advanced Electronic Applications, Inc.
Box C2160, Lynnwood, WA 98036
(206) 775-7373

Digital Digest-PACKET

*by **Lynn W. Taylor, WB6UUT***

463 Myrtle Street • Laguna Beach, CA 92651

★ Model Networks ★

Last issue we started our discussion of protocols with a look at the beginnings of Packet Radio. This time we will step away from the "real world" and into the theoretical side of Packet switched networks.

I'm using the term Packet switched networks here because our discussion applies equally well to commercial networks like Telenet and Tymnet as it does to current Amateur Packet networks.

All of these networks are based on the International Standards Organization's Recommended Model for Open Systems Interconnect (or, more commonly, the OSI model).

This model defines a network built of layers. Each layer is designed to talk to it's "peers" on the same layer by using the services offered by the lower layer, and to provide services to the layer above.

As an analogy, think of two company presidents who want to talk to each other (peer-to-peer). It is extremely unlikely that one would just pick up the phone and call the other. Instead, our company president tells his secretary (the layer below) to contact his counterpart in the other organization. She then uses the telephone (the layer below her) to dial the "network address" of the other guy's secretary. The two secretaries then talk peer-to-peer, make the appropriate arrangements and connect the two presidents, who converse without worrying about the details of the layers below.

The OSI model (see Figure 1) defines seven layers, each of which adds functionality to the layers below. Because each layer serves a distinct function, they can be implemented more or less independently: improvements at layer three are more or less independent of changes at layer one.

The seven layers, looking from the bottom up are the Physical layer, Data Link layer, Network layer, Transport layer, Session layer, Presentation layer and the Application layer. The physical layer is the easiest to understand. In a wire based network, the physical layer covers the wires, the network "topology" (who can talk to whom), what voltage levels and data rates will be used, and other associated issues necessary for any two (or more) nodes in the network to talk to each other.

In Amateur usage, layer one includes your two meter radio, the Bell 202 modem built into practically every TNC, the use of FM and the 1200 baud data rate. We deviate from this when we use 300 baud, 200 Hz shift FSK on HF, and faster modems and different modulation schemes are in use or under development.

On the Physical layer, all we want to do is allow two or more nodes to talk to each other with (hopefully) a relatively low error rate. The basic message unit at this layer is one bit.

The Data Link layer takes the physical layer and makes it look like an error free transmission line. In addition, this layer handles channel sharing when more than one node uses a given communications medium. Our Data Link protocol is called AX.25. When you tell your TNC to connect to another station, this command is handled by the Data Link layer, as is the construction of the individual frames on transmit, and error checking these frames on receive.

If the full ISO model were implemented, layer two would communicate with the network layer above, with users interacting at a higher layer.

The basic message unit here is one frame.

At the Data Link layer, the user sees a network which consists of a set of discrete paths to neighbor stations (in the OSI model, the entire concept of digipeaters is an aberration). The Network layer (layer 3) takes these discrete paths, and creates a larger, homogeneous network (see Figure 2).

Each node which offers Network layer services can receive packets from one of its peers, and forward it to another peer without the user having to know how to route the frames.

(cont'd next page)

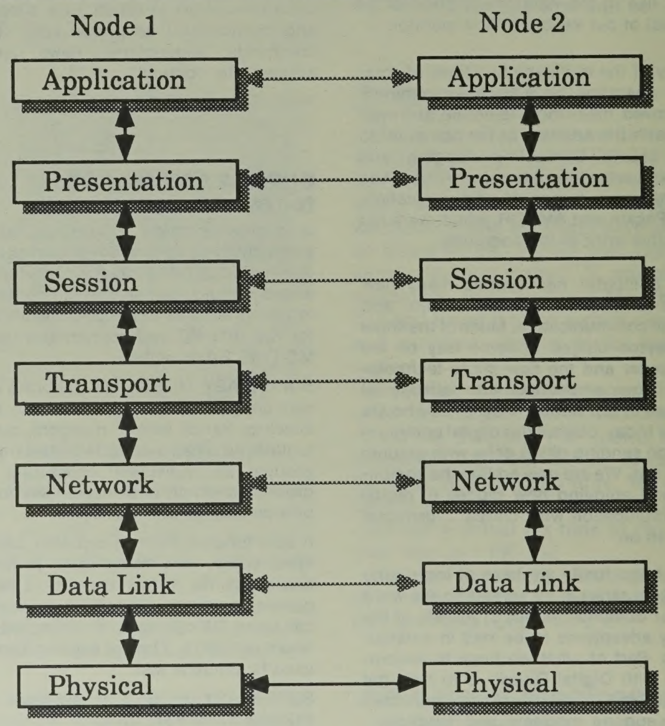
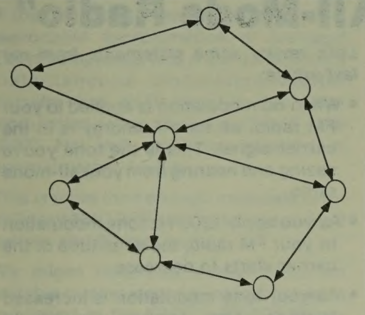
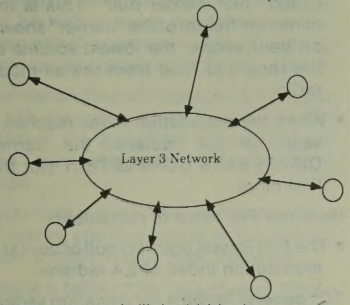


Figure 1: The ISO Open Systems Interconnect model. Peer-to-peer communication is shown as gray arrows, while solid lines represent actual communications paths.

(cont'd from previous page)



A layer 2 network: composed of seperate paths.



A layer 3 network (links hidden)

Figure 2: Data Link vs. Network Layers

A couple of Layer 3 protocols available for Amateur use are NET/ROM and ROSE, both of which implement totally different Network protocols while accomplishing the same general goal: providing existing Data Link layer users with Layer 3 services.

Our smallest message unit at this layer is called a packet.

Except for the user interface defined by some of the Network layer devices, this is as high as Amateur networks have reached.

At the Transport layer, one or more Network layers are used to provide the throughput and reliability needed by the next layer up.

For example, a Layer 4 protocol could establish two connections across the country, one following a northern route and another via the southern route. Traffic from one coast to the other would be divided up equally between the two paths, doubling the throughput while reducing the load on the points in-between.

At this layer, our message unit is called a message.

In the full implementation of the OSI model, users never stray below the Session layer. A Session could be used for a user to connect to another user, or to a host computer, or could be used between two computers to transfer files.

If the Session is used to establish communications between two programs (or processes), then the process is called binding.

The Session layer also uses the Message as its smallest unit.

At the top is the Application layer. In a theoretical full implementation of the ISO model, the network essentially disappears. In its p lace we have what appears to be a monolithic computer which automatically assigns the individual smaller units (individual computers) tasks which need to run on the network.

As an example, a network set up to maintain and access a database would distribute some of the data to each machine and probably duplicate the data on more than one machine so individual failures would not cause the whole system to fail.

Where are we going with Amateur networks? Probably not as far as the Application Layer, even though we see a glimpse of this in the packet clusters now popping up., and we need to be very careful not to go backwards and rip out the fairly recent advances at Layer 3.

Remember, when you see traffic from a NET/ROM node, it is very easy to see that the **traffic is generated by that node.** We have to consider the alternative, which is repeated transmissions by stations using dumb digipeaters - worse, but spread across a large number of network addresses (callsigns).

More work is needed at all three layers in existence now: separating the node-to-node communications from the relatively crowded user channels (on Layer 1), at Layer 2 protocol changes could make better use of the available bandwidth, and more efficient Layer 3 protocols could speed our messages on their way more efficiently.

We also need to keep working our way up the layers: we won't really know the benefits of the Transport layer and above until we've had a chance to try them.

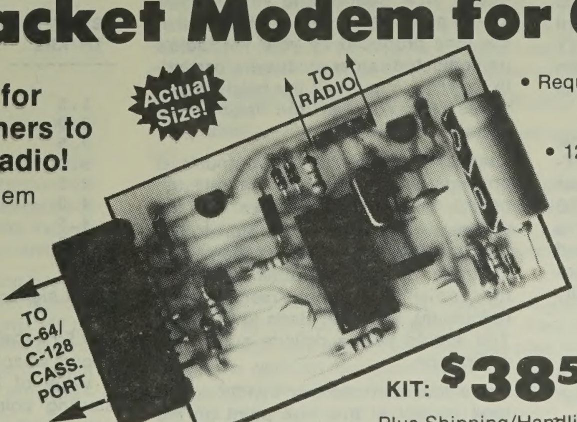
(cont'd on page 11)

Tiny Packet Modem for C64/128

The easiest way for Commodore owners to get into packet radio!

Use this plug-in modem with public domain DIGICOM software on disc.

- High quality PC board & components
- 1 year limited warranty on assembled modems



- Requires NO EXTERNAL power supply
- On-board safety timer
- 1200 Baud = 10 meters, 2 meters, 220 MHz, 440 MHz
- Includes easy-to-follow instructions

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—PACKET

by Norman Sternberg, W2JUP
279 Adirondack Drive • Farmingville, NY 11738

"I Can't Afford A Deviation Meter... or How I Learned To Love My All-Mode Radio"

Continuing with last issue's diatribe on the subject of deviation, modulation indices, Carson's Rule, Bessel Functions and the Evils of Excess, we come now to some practical questions (or grumbles) that arise from within the ranks of the user community:

- "How can I check this stuff without an expensive service monitor like the 'professionals' use?"
- "I tried monitoring my signal on my scanner (or 'on my HT' or 'on another FM radio') and it sounds fine to me...."
- "I can't afford one of them deviation meter things...spent all my bucks on that nifty all-mode VHF/UHF radio so I can work the bird".
- Ah, such threnody...sounds of despair, hopelessness and wailing.

HAVE NO FEAR - HELP IS NEAR!

No deviation meter? No service monitor? Oh well....that's a bummer...but wait - didn't you say you had that nifty all-mode VHF radio? Sure you did! And that's a dandy tool for checking deviation if you don't have anything else.

Now here you're supposed to ask, "What the heck does my all-mode radio have to do with checking deviation?" And here's where I tell you how you CAN use any reasonable all-mode VHF/UHF radio in place of that deviation meter you DON'T have.

THE PLOT THICKENS!

It seems that not many of our brethren (and sistern?) know that you CAN generally copy reasonable FM RTTY and Packet signals using an all-mode radio in the SSB modes. It's a trick I resorted to years ago when I couldn't get a decent two-meter signal from W1AW's RTTY bulletin transmissions on 147.555, from Newington, CT...about 70 miles north of here.

I've verified this stunt with several typical all-mode radios, including the Yaesu FT-225RD, FT-727R and FT-736R. These VHF/UHF radios receive CW, FM, USB and LSB (and AM in some cases). I've often used LSB to successfully copy and print weak FM Baudot/ASCII/FEC signals that - in many cases - were totally unusable in FM mode.

HERE'S HOW

Some of the recent all-mode radios have an isolated, unprocessed audio or "data" output circuit that bypasses the deemphasis and gain-control circuits and provide a very stable reference output. If this separate output is not available, use the normal external speaker output connector.

You don't need a fancy scope - any old surplus scope that can display an audio signal as a simple sine wave - bandpass up to 200 KHz is fine. However, the better the scope, the easier the job.

Arrange your packet controller so that its AFSK output level control is readily accessible. Turn the AFSK output level control to MINIMUM OUTPUT (this is usually counterclockwise in most controllers and s).

Connect the AFSK output circuit of your packet controller to the FM radio you intend to use, as you intend to use it. (If you're going to feed the AFSK tones into the microphone jack, use that connection method for these tests.)

Connect the audio output from your all-mode radio to your scope.

Connect a dummy load to the output ciruit of the FM radio you'll be testing.

Set your FM radio for its lowest RF power level.

Put the controller or into its "calibrate" mode using the SPACE or higher tone and key your transmitter with MARK tone. (We'll assume 1200 Hz for your packet controller.

Set your all-mode radio to CW mode and tune for the UNMODULATED CARRIER from your FM radio. Tune the all-mode radio so that the audio output produced by your transmitted SPACE tone is comfortable in volume and somewhere between 500 and 1000 hertz.

Adjust your all-mode radio's audio output level control and your scope's sweep and vertical gain control so that the tone produced by your FM radio's unmodulated carrier produces a 'carrier'-like display about half the height of the scope face. You can also listen to the output tone as a guide.

Gradually increase the AFSK output level on your packet controller or until the height of the scope display and the volume of the audible tone start to decrease. Continue increasing the packet controller or 's AFSK output level until the "carrier" on the scope reaches a null (minimum), and then starts to increase. You should hear a definite null in the audio tone.

Leave your controller's or 's AFSK output level control at that null point on the scope display or the audible tone.

At this point, you now have a Bessel Function First Carrier Null.

Let's review some statements from my last article:

- When no modulation is applied to your FM radio, all the RF energy is in the carrier signal. This is the tone you're seeing and hearing from your all-mode radio.
- As you apply 1200-Hz tone modulation to your FM radio, the amplitude of the carrier starts to decrease.
- As your tone modulation is increased further, the carrier amplitude eventually reaches ZERO - the so-called "first carrier null". This is the minimum height of the "carrier" shown on your scope; the lowest volume of the tone you hear from the all-mode radio.
- When the modulation index reaches a value of 2.4 radians, the carrier DISAPPEARS COMPLETELY (for the first time).

Here is a key value to remember:

- The first Bessel (carrier) null occurs at a modulation index of 2.4 radians.

The general formula for deviation versus modulation index is:

MI = Delta-F / FM

Modulation Index = Peak Deviation / Modulating Frequency or, looking at things in the "opposite direction",

Delta-F = MI x Fm

Peak Deviation = Modulation Index x Modulating Frequency

Here's a convenient table of DEVIATION versus MODULATION INDEX for 1200 Hz MARK tone.

DEVIATION in KHz	MODULATION INDEX Radians @ 1200 Hz
1.5	1.25
2.0	1.67
2.5	2.08
3.0	2.5*
3.5	2.9
4.0	3.3
4.5	3.75
5.0	4.17
5.5	4.58

**A bit higher than our First Carrier Null*

Our First Carrier Null with 1200 Hz tones occurs when our peak deviation reaches a value of 2.88 KHz - an acceptable starting point modulation for general packet radio operation.

(cont'd next page)

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If the FM transmitter under test has a reasonable approximation of standard EIA preemphasis, and if the transmitter's instantaneous modulation limiter circuitry has NOT been at this same modulation index, then the SPACE tone (2200 Hz) will produce deviation of approximately 4.4 Khz.

This is more than enough modulation for ordinary 1200 BPS NRZI packet service 2 meters and 70 centimeters.

We might note that similar ideas on suitable packet modulation indices were published in the FADCA BEACON way back in 1984. The FADCA article suggested deviation levels between 2.0 and 2.5 KHz as being the optimal modulation with the signal-to-noise or quieting ratios usually obtained on 2meter packet.

Now switch your all-mode radio from CW to FM, key your transmitter again and measure the amplitude of the received tone modulation displayed on your scope.

If you have a scope with calibrated vertical scales, you'll be able to plot a chart of audio voltage versus peak deviation.

Here is a table of the actual peak deviation values and post-detected audio output voltages, as measured on a well-known service monitor and recovered from the isolated, deemphasized 600-ohm output of my all-mode VHF/UHF radio, and displayed on a laboratory-type calibrated scope.

DEVIATION in KHz	DEMODULATED MARK TONE Amplitude in millivolts
1.0	320
1.5	450
2.0	600
2.5	740
3.0	850
3.5	980
4.0	1080
4.5	1240
5.0	(unable!!)*

**Internal deviation limiter took over here!*

What's obvious at the bottom of the table is that my FM radio could not cope with the higher modulation indices because of the compressing action of the radio's internal modulation limiting circuits.

If the radio's modulation limiting circuits are activated, then there's a strong probability that the transmitted signal will be severely "twisted", with the SPACE tone significantly lower in amplitude than the MARK tone. See my previous article for comments on the "twist" effect.

The best solution here is to open the FM radio, set the "deviation" control "wide open" and then reduce the "microphone gain" control to obtain the desired modulation and deviation levels. If your FM radio has only a single "deviation" control, then you'll need to do considerable tweaking between that control and your packet controller's AFSK output level control to obtain the best "marriage".

To illustrate what we've just done, let's look at a simplified sketch (fig. 1) of a mark-tone-modulated FM signal as it might appear on a spectrum analyzer. The sketch shows the carrier and several sideband pairs that would occur at some modulation index well below 2.4 radians:

```
   (figure 1)                          CARRIER
                                      /
                                     |
                                     |
           1st Sideband              |          1st Sideband
                       \             |         /
                        |            |        |
2nd Sideband            |            |        |             2nd Sideband
         \              |            |        |            /
          |             |            |        |           |
__________|_____________|____________|________|___________|________

    -2.400 KHz   -1.200 KHz    Fc    +1.200 KHz  +2.400 KHz
                                ^
                                |_______ Heard in CW mode
```

The next sketch (fig. 2) is an approximation of the relationship between carrier and first two sideband pairs as the carrier approachs zero amplitude and the modulation index approaches 2.4 radians.

```
2nd Sideband                     (figure 2)                 2nd Sideband
         \                                                 /
          |                                               |
          |                                               |
          |                                               |
          | 1st Sideband              1st Sideband        |
          |             |                       |         |
          |             |        Carrier        |         |
__________|_____________|__________|____________|_________|________

    -2.400 KHz   -1.200 KHz    Fc    +1.200 KHz  +2.400 KHz
                               ^
                               |         Nulled or barely
                               |_______  heard in CW mode
```

If you're lucky enough to have an allmode radio whose accessory audio output is fixed, that is, independent of the front-panel volume control, you now have one nifty test tool.

Once you've gone through this ritual, you can easily make a chart showing the deviation equivalent to a given audio output voltage from your all-mode radio in its FM mode. Then' it's a simple question of pointing your VHF/UHF beam antenna towards the station whose modulation you wish to measure and take a reading on that stations's deviation with your new "calibrated" allmode radio as a "deviation monitor".

W2JUP's FIRST RULE OF INTERMEDDLING LINK TRASHERS

"The validity and usefulness of any link is dependent on the quality of each node in that link...."

A number of nodes in our area are good examples of bad TNC-to-Radio setup. Using the methods outlined above, I've measured almost all of them on our 144, 221 and 430/440 backbone channels. Too many of them are just plain stinko. Their scuzzy modulation contributes to your linking difficulties and inevitably degrades the performance of *any* networking opertaion.

My (very diplomatic and tactful!!) reports to the node operators of excessive deviation, as measured by my "remote deviation meter", have nearly always been confirmed when the node operator was able to visit the node sites with a moreelaborate measurement tool such as a genuine deviation meter or service monitor. In most cases, my remote measurements have been well within five percent of the readings taken at the node site with the more-expensive, traditional test gear.
The results have usually meant better node operation, improved networking links and greater throughput. All this achieved with a minimum investment in extra equipment.

Sometimes a craftsman's skill is more important than the quality of his tools.

ALTERNATIVE HF DATACOM

by **Paul Newland, AD7I**

Post Office Box 205 • Holmdel, NJ 07733-0205

★ SELCAL SYSTEMS ★ ERROR CONTROL & MORE

APLINK STATUS UPDATE

APLink now supports semi-automatic message forwarding. Vic Poor, W5SMM, APLink's designer says it better than I can so I will include Vic's wording from the distribution diskette.

"Beginning with Version 3.7, APLINK now includes an Amtor SemiAutomatic message forwarding feature. This feature permits a sysop to forward one or more messages to another APLINK system without passing the traffic through the packet network.

"It is not expected that sysops who have VHF access to the National Packet Network in the U.S. would use this feature for domestic traffic. This feature is more suited to passing traffic over long HF hauls where packet has not proven successful or is not available. In other words: do not abuse this feature - use packet if you have it.

"This feature is called semi-automatic because, unlike packet, an operator must initiate the transfer. It is simply not socially acceptable to begin transmission of an amtor signal without listening first to make sure the frequency is not already in use. Fullautomatic would require blind transmissions - a sure way to alienate your fellow operators."

More on the progress of APLink next time.

SELCAL

One of my interests, both in ham radio and professionally, is the use of MF/HF SELCAL systems. I recently published a construction article for a SELCAL system that makes use of AMTOR FEC signals(1). If you have been looking for a simple SELCAL system for use on MF or HF circuits, you might want to read the QEX article for more details.

Also, I recently presented a paper about a SITOR (AMTOR) FEC MF/HF SELCAL decoder for use by the marine industry at the last RTCM conference(2). The paper points out that almost all commercial shore stations (both phone and telex) transmit traffic lists using FEC. So, why not just use those signals for a SELCAL system? That paper outlines a simple device that might be included in a marine SSB radio (a derivative of the device described in the QEX article). The concept met with good support from both the radio vendors and the service providers (i.e., commercial shore stations). Who knows, we might see SELCAL decoders based on CCIR 476/625 (SITOR/AMTOR) included within SSB marine radios in the near future. I might also add that one of the commercial radio vendors that expressed interest in the marine SELCAL system also makes ham radio equipment. Time will tell how this will all shake down.

TIME DISSEMINATION BY DATA RADIO

Governments around the world keep track of time of day via fancy atomic clocks, for the benefit of their country. However, keeping time in some out of the way laboratory doesn't do the population any good unless the population is made aware of the time information. Historically, the government has made use of short wave transmitters to disseminate this information to those who need it. This is done via voice transmissions using regular AM emission or SSB with full carrier.

In North America there are two stations that provide this information. One is WWV in Fort Collins and the other is CHU in Ottawa (Canada). An additional wrinkle in the transmission from these stations is that they both broadcast data signals (in addition to voice) that allow computer devices to determine the time, without requiring that a human listen to the voice transmissions.

In the case of the U.S. station, its data signal consists of a 100 Hz subcarrier that is on/off modulated to send one of three states, each second. The duration of the 100 Hz subcarrier determines the bit value (one, zero or missing pulse) with a data rate of one bit per second. The data are blocked into one group every minute. Each block contains data on the day of year, UTC hours and UTC minutes, along with a few other bits. It takes a full minute of clear copy to get the correct time. Although this system works, it is slow and requires special circuitry. Heathkit makes a receiver/clock all rolled into one to decode and display these signals. I have one of these clocks and it works pretty well but it will sometimes be off by a minute or two. I think this is caused by the slow speed of the system and that it relys on on/off keying (like morse code). If noise appears at a time when the 100 Hz carrier may be on but it's actually off, then the noise can confuse the decoder. Perhaps this leads to the slips in the minutes digit.

The Canadian station, CHU, uses a different method to transmit the digital time of day information(3). It uses the standard 8 bit start/stop asynchronous transmission format at 300 bps. The data are transmitted using standard telephone modem FSK tones of 2025 and 2225. The data are blocked into a group that contains day of year, UTC hour, UTC minute and UTC second. From 30 seconds to 40 seconds past each minute a block is sent once each second. Thus, in one minute, a decoder would have 9 chances to decode the correct time. Additionally, because only one second of clear copy is needed to obtain time information (as opposed to one minute for WWV) a decoder gets many more opportunities during a 24 hour day to "re-synch" to the transmitted time.

ERROR CONTROL

Neither transmission system provides any error protection to ensure that clocks do not accept bad data. However, a simple trick can be used to provide error detection. The trick is that you know any two blocks should differ by a specific amount (WWV: 1 minute; CHU: 1 second). So, by comparing the most recently received block with the previous block, the decoder can reject any blocks that do not have the constant difference expected.

Actually, each CHU block consists of two copies of the time information; the thought being that one doesn't need to do the block to block comparison. Instead, just compare the first half of a block with the last half and if they are the some then assume they are both OK. In practice, some errors will sneak through if this is the only test done.

In a prototype system I did about a year ago for CHU transmissions, I found that I needed to compare block to block as well as the first and last half of each block. Comparing two successive seconds cleared out all known problems of errors sneaking in. So, to ensure complete overkill, I let the final check be as follows: (1) that all blocks had to match themselves (first half the same as the last half) and, (2) that the time information in four consecutive blocks had to differ by exactly one second. Only then would the last block of data be used to adjust the front panel digital clock. This got rid of all errors introduced by noise and interference. And, surprisingly, it didn't significantly reduce the number of valid time updates received during a 24 hour period. When signals are good you are almost as likely to correctly receive four blocks in a row as you are two blocks in a row.

(cont'd on page 17)

EXTERNAL HF MODEMS...

When it comes to HF packet, it's the modem portion of your of your TNC that makes or breaks the system. If your controller is not currently set up for 300 baud operation, you might consider an external modem such as the HAL ST-7000 or the AEA PM-1.

On VHF or UHF packet the selectivity of the modem is not all that crucial because most stations are equipped with either digital synthesized or crystal-controlled VFO's. HF, however, presents numerous problems requiring a higher level of sophistication in the modem. Widespread variance in conditions creates a situation where not all transmitted signals are received with equal strength by the stations on a single frequency. This enables numerous stations to transmit packets simultaneously. Then there are stations that, either intentionally, or due to the condition of their equipment, receive on a slightly different frequency than they transmit. This can cause numerous, closely packed, but slightly off-frequency signals to be received at the same time. Thrown on top of all this is the normal QRN, QSB and QRM you run into on the low bands.

So why put up with all this hassle to play packet on HF? Well, because it's fun! Occasionally, when conditions are good and you can get your contact to QSY to a quiet frequency, 300 baud HF packet can be faster than 1200 baud 2 meter packet with its nodes, digi's, and forwarding BBS's.

I recently had a chance to look at the schematics of the HAL ST-7000 HF Modem. This is a unit that connects to your TNC in either one of two ways. Using the modem disconnect header, the ST-7000 will "replace" the modem in your TNC. You can also connect the OUTPUT from your TNC, normally going to your 2 meter rig, to the ST-7000 and it will convert the 1000 Hz shift AFSK to 200 Hz shift AFSK into your HF rig. This arrangement is advantageous because it allows bypassing the HF modem with the push of a button.

The ST-7000 is actually three "modems." One PLL detects the 300 baud data, another detects errors for the tuning indicator, and the third interfaces with your 1200 baud TNC. But the main salient feature of the unit is the associated "filtering" circuitry. The incoming HF audio is passed through anti-aliasing filters, 6-pole Chebyshev switched capacitor, bandpass filters, and a front panel controlled AGC circuit before it gets to the PLL. This sophisticated circuitry, along with an excellent 20 segment LED tuning indicator, are the elements that begin to make HF packet a usable mode.

The real advantage of the ST-7000 and the PM-1 have over "all-mode" controllers, however, is that their design recognizes the future of HF packet in going beyond the 200 Hz shift principle. These units provide for operation at a 600 Hz shift which is infinitely more suited to HF operation. The wider shift allows each tone to be filtered separately, thereby allowing steeper notches and more precise tuning. Although 600 Hz shift is not currently permitted below 28 Mhz, I believe it is a matter of time before the FCC catches up to this advanced technology. Wideshift 1200 baud operation is already permitted on 10 meters and the mode is bound to expand as it attracts more users.

By the way, both the HAL ST-7000 and the AEA PM-1 can be used on RTTY and AMTOR with the appropriate software. Digicom users can connect both units directly to the Commodore with a special cable modification.

by Craig Rader, N4PLK
922 Baltimore Drive
Orlando, FL 32810

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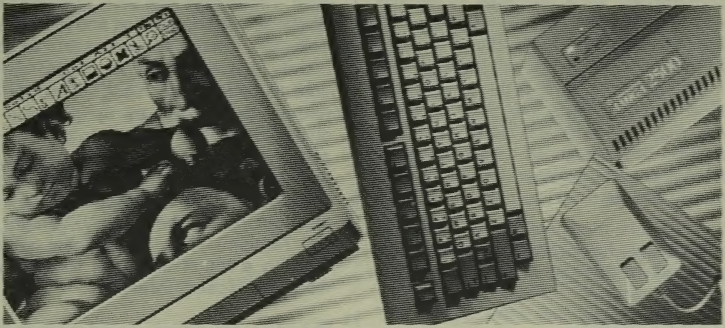

That's our estimate of the number of people who make or enhance their living creating visual images or music. It includes animators, video producers, graphic designers, composers and arrangers, design engineers, illustrators and artists, art directors and chief executive officers (for their multi-media presentations). Which means, to all those creative people, there is now a computer that can not only process words and numbers, but also create almost anything they can conceive. If you're one of these people, come see us.

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Atari ST Mailbox Available...

Thor Andersen, LA2DAA, has written a "W0RLI mailbox" program for the Atari ST 520 and 1040 computers. The software has been tested with an AEA PK-232 and PacComm TNC-200 and works fine with both TNCs. To obtain a copy of the software, send a 350-kbyte or 720-kbyte diskette containing public domain programs to:

Thor Andersen, LA2DAA
Riddersporen 6
N-3032 Drammen, Norway

Submitted by:
Thor Andersen, LA2DAA @ LA1G
Source: - Gateway -

Digital Digest

BITS & BYTES

by *Lacy McCall, AC4X*

3001 Zelda Drive • Montgomery, AL 36106

When you climb out of bed tomorrow morning, don't turn on your ham rig. Make your coffee, and while you are waiting, find a quiet spot and a comfortable chair. If you rise early, it may still be dark and that is even better.

Spend at least five minutes thinking. Contemplate what you plan to do and what it means to you. Be introspective and thorough. Don't miss thinking about the details and don't be pessimistic. The human mind is a curious thing and if you allow yourself just a few quiet minutes, you may be surprised with what will appear. It's great to organize your thoughts, but it is even greater to take time to be aware of what is around you.

Try it, and let me know how it works. We may be able to put the "shrinks" out of business. While you are thinking, contemplate this.

LONELY ROAD...

Night was approaching as the small blue car made the sweeping turn from South to East. The Tamiami Trail was deserted these days. Since it took so long to cross the Everglades, the driver shifted in his seat thinking about the long dark ride ahead.

No music played tonight, just the sounds of some distant ham keying the repeater could be heard on the 2 meter DM radio tucked beneath the dash of the car. The new rig had no dial and only one small green LED to acknowledge that the power was on. It had taken Steve some time to get used to a rig that didn't have an off and on switch. Controlling the rig with the car computer had been easy to learn.

Now that all the new autos were fully automated and computer controlled, there was not much choice; any mobile transmitter had to be interfaced with the onboard computer. Both amateur and commercial mobile stations were now tightly controlled, just like everything else. It had taken Steve a month to get the necessary interface and equipment and another month to get the necessary forms filled out and approved.

The spectrum was so valuable now, that it had to be carefully allocated. Steve knew that proper use of his new toy was mandatory or he would surely lose it. The oncoming car lights awakened Steve from his deep thought, and caused him to check the speed setting. You could still override the speed setting of the vehicle, as Steve had done tonight, but you must pay attention. The sealed recorder on the computer kept a log of actual speed and permitted speed. Three violations and you would not have to worry about any speed. The same was true for the Digital Modulation Two Meter Radio; mess up and it was time to look for a new hobby.

Thirty miles an hour, was too slow since Steve was an old timer. He remembered the time when you could easily drive seventy on this road when traffic was light. Those days had gone also. With the continued shortage of oil and increase in pollution, it had been necessary to constantly decrease the allowable speed limit to restrict auto usage. Few people had any desire to go any long distance at such slow speeds. The result had been astounding. Not only was the road void of any big trucks on the highways, there were no families on vacation or anyone else just touring the country. Tonight on the Tamiami Trail, Steve knew he was wasting a lot of time, but tomorrow it would be closed; forever.

The heavy equipment would move in and remove it from the face of the earth, as had happened all across the country. Where roads had crossed any environmentally sensitive area, the road had been removed. "Priorities", the president had said ten years ago. In his last thirty years as a ham, it had never occurred to Steve that he might never be able to drive from Tampa to Miami.

When he got licensed in 1979, the world was a fast paced and open place. The thrill of the DX contact in the wee hours of the morning made all the study for the license worth the effort. Now, there was little need for study. With only two ham bands and everything tightly controlled and automated, almost all the exam was about the procedures and rules. The small box under the dash could work any station in the world so long as Steve took the time to get a priority and operating schedule approved.

The long night's drive was lonely and gave Steve plenty of time to think. He had not always been willing to adapt to the new ideas and technology. As he stopped the car's engine in a rest area that would soon be gone, the quietness and fresh air assured him that the entire world was an improving place.

WHAT WAS THAT???...

Occasionally, a little fiction can make a good point. Many of us only read magazines and then only technical journals. Sometimes it appears that these contain fiction, but not so. What they contain usually is a brief look at the immediate past and a compilation of current facts. Storytelling is an old art, and besides, it is fun.

TAPR 1989...

On February 25 and 26, the 1989 TAPR Annual Meeting was held in Tucson. What this means for most of us is that the people at this meeting are spending a lot of time advancing the technology available to amateur radio.

During the meeting, Tom Clark (W3IWI) gave an update on the current MicroSat project. In mid July, four satellites, each just 7 inches square, will be launched by an Ariane 4 rocket. Sponsored by various groups, each will include a BBS system for mail handling. This is a good example of the effort this small group is putting into the leap forward.

Also, at the meeting, Dave Toth (VE3GYQ) discussed the coordinated HF BBS Network. This system requires special FCC approval and the system managers are working hard to improve what is difficult to accomplish on HF. Last December, the entire system had a melt-down when conditions were poor and congestion with "retries" all but eliminated useful traffic. Part of the notion about this coordinated net is that unless you are a part of the network, you should use other frequencies. Please take a minute to listen on HF packet and pick a clear channel. The net is working hard to serve the amateur community and deserves our support.

High speed modems were just one of the many topics discussed at the TAPR meeting, and several projects were discussed with transmission speeds up to 56 kbps. As the new modems are developed, wide use of faster digital transmission is not far away, and it is likely that the price will come down dramatically.

The people at the TAPR meeting illustrate the spirit of amateur radio at it's best. If you are technically inclined, I am sure this group would welcome your help. If not, take time to keep up with what they are doing, and tell others.

NEW SOFTWARE...

A new addition here is a program called GRAMMATIK III by Reference Software. It is reputed to be a "Powerful Writing Improvement". Can you tell?

It is a very good aid to the writer. Not only does it check noun-verb usage, but it compares all sorts of phrases and tells you when you are redundant or using a cliche. You can use the GRAMMATIK speller or the one included with your word processor.

(cont'd on page 15)

Another "hands-on" program by: Lacy McCall, AC4X

The following "C" Code tests the letters in a callsign, following the same format illustrated in previous issues with Turbo Prolog. The progam was tested using Borland's "Turbo C" and may be typed and run.

```
 Test_cal.c //ac4x// Callsign Test Example Program
 ====================================================
 using Turbo C  to test Packet radio callsigns...
 ====================================================
#include "stdio.h"
#include "ctype.h"

int    STOP = 0;          /* controls the loop below */
char   mycall[7];        /* string array to hold test string */

int    test_it(char mycall[]);    /* function at end of prog defined here */

void main()      /* start of program execution */
   {            clrscr();       /* clear the screen  & print short title */
                cputs("CALLTEST.....for testing CALLSIGN Validity\n\n\n\r");

/*===== loop =====*/
        do {    cputs("Enter CALLSIGN to test:  ");
                gets(mycall);
                cprintf("[%s] ",mycall);
                if(!mycall[0])   /* we loop until a blank line is entered */
                        { STOP=1; }
                        else
                        if( test_it(mycall) )
                                cputs(" ...Callsign is Valid\n\r");
                                else
                                cputs(" ...Sorry...BAD Callsign\n\r");
            }   while(!STOP);
        clrscr();     cputs("\n\rBye...");      exit(0);
}

/***************************************************************************/
/*  TEST_IT   (c function)   defined at prog start so "main" can find it  */
/***************************************************************************/

int   test_it(char str[])
{       unsigned int  i;
        unsigned int len=strlen(str);

        if(len < 4)                           /* min call must be 4 chars */
                { cputs(" ... Too Short ... "); return(0); };
        if(len > 6)                           /* max call no more that 6 chars */
                { cputs(" ... Too Long ... "); return(0); };
        for (i=0; i<len; ++i )                /* loop thru to test for all ascii
                                                 and not delete or control char */
                { cprintf("<%c>",str[i]);
                  if( !isascii(str[i]) || iscntrl(str[i]) )
                      { cputs(" Non-ASCII or Ctrl Char ... ");
                        return(0); };
                }

        if( isalpha(str[0]) )     /* starts with letter */
                { if( isalpha(str[1]) &&     /* then a letter */
                  isdigit(str[2])     &&     /* then a number */
                  isalpha(str[3]) )          /* then a letter */
                  return(1);

                  if( isdigit(str[1]) &&     /* then a number */
                  isalpha(str[2]) )          /* then a letter */
                  return(1);

                  if( isdigit(str[1]) &&     /* then a number */
                  isdigit(str[2]) )          /* then a number */
                  return(1);
                } else

        if( isdigit(str[0]) &&               /* starts with a number */
            isalpha(str[1]) &&               /* then a letter */
            isdigit(str[2]) )                /* then a number */
            return(1);

       return(0);
}

/* end of program */
```

To test the program you can type any combinations of letters or numbers including control characters. When testing international calls, the combination is so varied that the test must be loosely structured. If you wanted to test just US and Canadian calls, you could create a much tighter test...try it.

(cont'd from page 5)

Soapbox:

For the most part, my articles have avoided opinion, or at least stuck to opinions which are based somehow on fact. The following represents my opinion only, not that of Digital Digest, its' editors or staff.

Last issue we talked about the birth of Packet Radio, and certainly much work has been done by many Amateurs to advance the technology, and to make it portable and affordable.

Amateur Radio deserves credit for these advances, but we did not attend the birth of Packet Radio, but instead followed well behind.

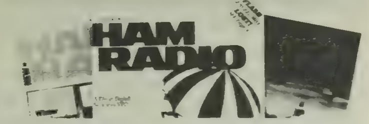
Some of this is due to FCC regulations in place at that time - it simply wasn't legal for us to do, but the other reason is the folks who were involved there, and in Amateur Radio at the time: they weren't the same people!

Some of these people were no doubt Hams, but some I'm sure looked at the hobby earlier, and said "Morse code?, I don't have time for that."

It is time that we, as Amateurs, look at the purpose of code (according to some, to limit the ranks to those who really want to be hams), and the effect (to make Amateur Radio less accessible to those we wish to encourage most).

Think about it.

Next time we will continue with our protocol discussion with a close look at AX.25



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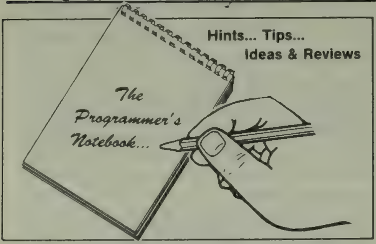
Digital Digest

by **Peter G. Smith, N4ZR**

2003 Sarazen Place • Reston, Virginia 22091


Hints... Tips...
Ideas & Reviews
The Programmer's Notebook...

As promised, this month let's get right into some real programming. Then, we'll give some operator's impressions of contesting by computer, using K1EA's CT logging software.

Hash for Hams

However it may sound, this has nothing at all to do with food, folks. I want to introduce you to a concept that is probbably the single most important building block for writing your own contest software, whether it's a simple dupechecker or an elaborate multiplier tracking realtime logging program. It's called hashing.

The one thing that all kinds of contest software have in common is the need to find things quickly in the computer. Duping is a matter of quickly comparing a new station's call with the calls of a list of stations already worked. Checking multipliers to see if you've worked a given station on a given band is a similar problem, only you work with lists of prefixes instead of lists of calls.

Of course, you could use a commercial database management program to do this job, but that's both expensive and really not necessary. Instead, you can, in a few lines of BASIC programming, write a routine that can do all of these things for you.

In the discussion that follows, I am assuming that you know the fundamentals of BASIC programming. Depending on the computer or the species of BASIC you use, there may be some small variations required, but I have tried to keep things to the most generic level. For example, no full-word variable names here, and line numbers are used since Commodore BASIC and BASICA, for example, still require them.

A Basic BASIC Hashing Algorithm

I have no idea how hashing got its name, but the term has come to mean any routine that derives a number (the "hash code") from a string of letters and numbers. It can be a surprisingly effective technique, if you take care of a few practical problems.

Let's look at some program code:

(see Table 1)

PROGRAM CODE (Table 1)

```
10 DIM A$(500)                    Create the string array
20 H = 0:INPUT A$                 Give it a call-sign to work on
30 FOR I = 1 TO LEN(A$)           Look at each character
40 H = H + ASC(MID$(A$,I,1)       Add up their ASCII values
50 NEXT                           All done
```

H is the hash code for A$, and can be used to store A$ in a string array, and to find it there again.

But nothing is ever simple, right? Using this algorithm, the hash code for N4ZR is the same as the one for N4RZ, ZR4N and so on. The way that problem is handled is shown below:

```
20 H=0:INPUT A$                  We've seen this part before, so
...                              let's abbreviate it
50 NEXT
60 IF A$(H) = A$ THEN PRINT      Compare A$ with the string in
   "DUPE": GOTO 20               A$(H); if the same, say so
70 IF A$(H) = "" THEN A$(H) =    If there's nothing in the slot
   A$: GOTO 20                   then put A$ in it and go again
80 H = H+1:  GOTO 60             Oops!  Something else in the slot
                                 so let's try the next slot in line
                                 and see what's there.
```

This little process will keep going until it finds either the call you've just entered (A$) or an empty slot. If it finds an empty slot it puts A$ in it so that the next time it'll be found and a "DUPE" declared.

In theory, this is all you would need for a duping program capable of checking any number of QSOs, either during a contest or afterwards; but there are several problems, which have to be dealt with. Let's look at a practical duping routine, virtually the same one used in the Contester 3 programs, annotated to help you understand why the refinements are needed.

```
10  DIM A$(2500)                     Set up a 2500-call array
100 INPUT A$:GOSUB 500:GOTO 100      Type in a call sign; gosub to
                                     the duping routine; then re-
                                     turn for more input
500 H = 0                            Clear old hash code value
510 FOR I = 1 TO LEN(A$):            Derive hash code
    H = H + ASC(MID$(A$,I,1):
    NEXT
520 IF I < 6 THEN                    For 4-letter calls,
    H = (H-243)*8                    Spread out the values of H
                                     across the entire 2500-slot
                                     string array; I is one more
                                     than the length of the call A$
                                     after the FOR/NEXT loop
530 IF I = 6 THEN H = (H - 308)      Do the same for 5-letter calls
    * 23:                            but with appropriate values
540 IF I > 6 THEN                    And for calls with 6 or more
    H = (H - 373) * 40:              letters
550 H = INT(H * (ASC                 Spread the value of H by one
    (MID$((A$),I-1,1))) / 10)        of 26 different factors, de-
                                     pending on the last letter of
                                     the call.

560 H = H - INT(H / 2500) * 2500     Limit the resulting value of H
                                     to the range 0-2500
570 IF A$(H) = "" THEN A$(H) = A$:   The call isn't in the array;
    RETURN                           put it there and return for
                                     more input
580 IF A$(H) = A$ THEN GOSUB 1000:   The call is a dupe; go to the
    RETURN                           "DUPE" message, then return
                                     for more input
590 H = H + 1: GOTO 560              Something else was in the
                                     slot; check the next one
1000 PRINT "DUPE": RETURN            "DUPE" message subroutine
```

Now this routine can be used just as it is, to check dupes from a manual log, or it can be incorporated in your program, with the right changes, to check dupes, or to track prefixes (for WPX) or countries, or whatever counts as a multiplier.

Performance Questions

There are a couple of issues to be concerned about in the performance of a duping routine, particularly if it is to be used in a real-time program. It must be capable of accepting almost any callsign

(cont'd from previous page)

format. Remember TYA11? Some popular contest programs fail this test, because they are dependent on the position of the number in the call-sign to handle it correctly. That's why I used the simple hashing routine laid out above.

In a general sense, the thing to remember about hashing algorithms is that their performance is dependent largely on how soon they begin to do increasing numbers of sequential searches (H = H + 1 steps). The reason for line 550 above is precisely that. If you think about it, there are only 4 calls that yield the same hash code as AA0A (put the zero in any of the four positions) or ZZ9Z. But how many can result in exactly the same code as MM5MMM or any other middle-of-thepack random call? One heck of a lot! If you were to plot it, the distribution of calls versus hash codes would approximate the classic bellshaped curve, and what that means is that well before you reach half-full in your duping array you will start to get far too many sequential searches. Then, pretty soon the sequential searches rooted in one hash code value begin to run into one another near the central peak in the distribution. Result - your duping program slows down drastically.

What line 550 does is to replace one peak with 26 different ones, more or less randomly distributed across the entire array. The buildup of sequential searches is massively delayed, and a practical, fast duping routine results.

I make no claims as a mathematician, and maybe this just proves you don't have to be a mathematician to write efficient programs. The fact is that I relied almost entirely on trial and error to develop this algorithm. Along the way, I also developed a program to test duping algorithms, reporting the duping performance and number of sequential searches against a random selection of call-signs. It's a bit long to reprint here this issue, but for anyone who wants it, send me a disk mailer, a formatted 360-K IBM disk and 65 cents postage and I'll happily provide it in ASCII format for you to try yourself.

Contesting by Computer

I recently had the chance to try out the K1EA software (called CT) in the ARRL DX Contest. Operated just over 12 hours in what seemed to be excellent conditions, mostly hunt-and-pounce mode. Had the chance to talk with a number of operators at better stations who used the software in the running mode, and this review is an attempt to synthesize these different experiences.

The software flexes the muscles of the IBM PC to good effect. Because it retains the entire log in memory during operation, the requirements are substantial. A 256-K PC can't even handle the program 512 Kb of memory is about the lower limit for a useful capacity. On my 640-K clone, there is room for about 4200 QSOs when you start a contest. The documentation notes that 73 bytes are required for each QSO, which suggests that over 300 Kb are required by the program and its data structures alone.

The software supports operating in the CQWW, ARRL DX, WPX and WAE Contests. It keeps track of your log, multipliers, score, QSO rates, per-band statistics, and so on, but even more important, it displays these variables in ways that are useful during the contest. That, and its effortless, almost bug-free operation, along with some truly spectacular bells and whistles (like a real-time packet interface that threatens to make the single-op plus packet class every DXer's favorite way to go contesting), make this a contest program without equal (so far).

When I first tried CT, I was concerned it might be another one of those programs that substitute programmer's cuteness for attention to the needs of contesters (especially at 4 AM on the second day), but I needn't have worried. I quickly became comfortable with the common commands, and a simple crib sheet took care of most of the rest.

CT revolves around the current log entry. The cursor starts in each case at the call-sign slot. You type a call and press (F8) to check a partial or complete call against all the stations logged previously, (F9) to learn if you've worked the station before and on which bands, or (F10) to check whether you need the country and on which bands.

But you don't have to do any of that. Pressing the space bar also dupes the call and moves the cursor to the variable part of the exchange (power in the ARRL, zone in the CQWW, serial number in WPX, etc.). The program supplies the zone in CQWW, and in the ARRL, if you have worked the station on another band, it supplies the power logged at that time. It assumes a 59 or 599 received report, but you can change that by tabbing to that field and entering another report (I didn't get a single report other than 599 in the entire contest, and I guarantee it's not because my signal is really that strong). Press (RETURN) to enter the QSO, and the cursor returns to the call-sign field again to log the next QSO. It's simple and effective.

Just as frosting on the cake,the program constantly displays your running QSO and multiplier totals band-by-band and in total, your running score, and your QSO rate over the last 10 and last 100 QSOs, as well as overall time on the air and time off. I have not been able to figure out how it decides what constitutes time off. Both WPX and WAE are quite specific about how much time must be taken off and how (number of periods, etc.). It would seem to be fairly easy to add provision for logging times on and off the air, but CT doesn't do this (yet), so you will have to add them with a word processing program after the contest, and keep track of them manually.

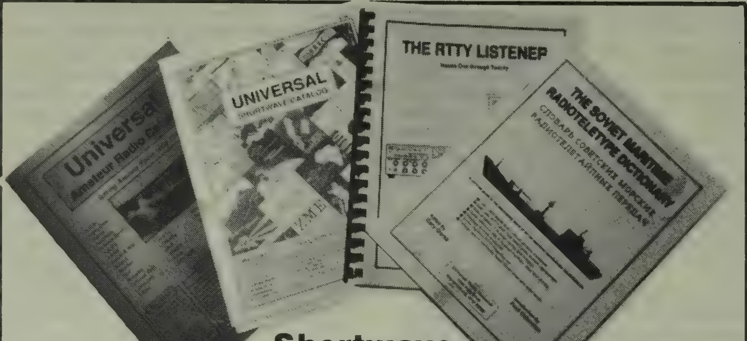
In CW contests, CT may be used to transmit CW integrated into the logging program. For example, type a station's call-sign into the log and press the (INSERT) key - the program transmits the other station's call and a contest exchange. Press the (+) key by the numeric keypad, and it sends QRZ for the next contact in the run, while simultaneously logging the contact. I was surprised to discover that once it has begun to send a CW message, CT can simultaneously edit the log, enter a call-sign, check a multiplier or do any other log-related function. This useful simulation of multitasking makes the integration of the CW into the program much more natural and comfortable than if the two were mutually exclusive.

The CW sending is a relatively new addition to CT. The CW output can be taken from either of two serial or parallel ports, and only a very simple basic interface is needed to key a modern exciter. You may feel the need for a weight control, however, in which case the documentation suggests using an interface made by Jim Talens, N3JT.

The assortment of CW messages provided is fairly limited, although all of the basic requirements are there. There is one bug in the CW routine as it stands. (F6) is used to send a "CALL" message. (F7) sends a "?" Press (SHIFT) + (F6), and the program gives you a window into which you can type a replacement message.

However, if you enter a message more than ten characters long, it unaccountably flows over into the (F7) message space. If you enter a new message for (F7) with (SHIFT) + (F7), then the message under (F6) is truncated to ten characters, and it becomes grafted onto the end of the message sent when you press (F6). If you enter a message into (F6) that is precisely ten characters long, whatever is in (F7) is erased.

(cont'd on page 14)


THE RTTY LISTENER
UNIVERSAL
SHORTWAVE CATALOG
Universal
Amateur Radio Ca
THE SOVIET MARITIME RADIOTELETYPE DICTIONARY
СЛОВАРЬ СОВЕТСКИХ МОРСКИХ РАДИОТЕЛЕТАЙПНЫХ ПЕРЕДАЧ

Shortwave Listeners...

One of the company's D-D came across in Dayton which truly seems to cater to SWL, as well as Amateur interests is Universal Radio, Inc. They displayed one of the largest selection of books and pamphlets on shortwave listening we have ever seen.

If you're a shortwave listener, or ham who likes to venture into other areas of the radio spectrum, and would like to know more about deciphering the various digital signals heard, Universal probably has a book on the subject. Universal even publishes their own books and newsletters pertaining to various SWL interests.

One such publication is "The Soviet Maritime Radioteletype Dictionary." This book, written by Gary Gorka and Fred Osterman, explores one of the most exciting fields of RTTY monitoring. This is a fascinating activity even if you do not speak one word of Russian! The book begins with an introduction to communications in Soviet society. The main section of the book features a three column transliteration dictionary of commonly used words on Soviet maritime circuits. The first column will show you the word as it will appear in Latin characters on your RTTY unit (...any RTTY unit). The second column will show you the word as it will appear 'if' your RTTY unit can display Cyrillic. The third column shows you the word's meaning in English. Over 1600 words are translated. While not evesy word of the telex will be understood, enough key words are provided to usually give you a clear idea of the meaning of the message.

The book also contains tables of Russian holidays, names, numbers, days of the week, etc. The Soviet telex format is broken down and explained. A list of frequencies, coastal stations and Soviet ships are also provided. If you like monitoring unusual RTTY, you will like this book. Price of the book is $11.95 + $1.00 s/h.

Universal also publishes separate Amateur Radio and Shortwave Catalogs giving a complete listing of the books along with amateur and shortwave gear available from their company. The catalogs are $1.00 each.

Contact: Universal Radio, 1280 Alda Drive, Reynoldsburg, Ohio 43068
Phone Orders: 1-800-431-3939

OMNIWARE... introduced at Dayton a new Morse learning software program called, appropriately enough, MORSE CODE. The Program was co-authored and produced by James Dalley, W0NAP and Augie Hansen, KB0YH. Jim has spent many years as a ham, engineer and educator and Augie is well known for his authorship of various computer publications, including the book "Proficient C" published by Microsoft Press.

Several interesting features were developed for MORSE CODE from Jim and Augie's corroborative efforts. For one, they have incorporated the Farnsworth Method for sending and learning the code. In the Farnsworth Method, the sending of code characters is speeded up and the space between characters is lengthened. This feature is included at speeds below 15 wpm while standard timing is utilized above that speed. The reason for this, is to help force students of Morse to hear characters as complete sounds, and not as individual 'dits' and 'dahs', which hampers learning the code as a distinct language.

Another neat feature included in the program are the QSO & Message files. These files are set up to resemble that of monitoring a two-way QSO off the air. There is a difference in pitch set to differentiate between operators as if in a two-way exchange. This is accomplished by embedding the desired frequency (pitch) between two @ characters in the ASCII file. For example, to change the frequency to 1200 Hz, you would insert @1200@ at the appropriate place in the ASCII file. None of the embedded characters will be sent or printed to the screen.

Several other features include:

- Random code groups with six levels of character difficulty
- Converts ASCII files to Morse Code
- Code oscillator for sending Morse Code with a radiotelegraph key
- Code speed selectable from keyboard
- User-friendly menus in color or monochrome display
- Automatic adjustment of code speed timing constant for computers with different clock frequencies
- An audio cassette recorder can be used to make tapes with code groups or text from ASCII files (if computer has a cassette port)
- The program will work with any IBM (or clone) running DOS version 2.0 or higher
- Complete documentation manual is included with tips for sending and receiving

MORSE CODE is available for $19.95 from: OMNIWARE, P.O. Box 37048
Denver, Colorado 80237-0048

(cont'd from page 13)

CT breaks new ground for the WAE contest by providing for automated handling of that contest's "QTC" function, in which non-European stations gain additional points by reporting their QSOs to European stations they contact. Press (ALT) + (S) and you're presented with a window and submenu to automate transmission of a QTC that complies with the rules.

I could go on and on, but you get the picture. For further information, write:
Bill McGowan, KC1EO, 33 Truell Road, Hollis, NH 03049.
Better yet, send him $25 and become a registered user. That's a pretty tiny price for such a great program!

That's all we have space for this time see you all next issue, for more programming and a review of the EASYDX logging program, another product of the Yankee Clipper software machine!

*** Please Note ***

If you have news and information of interest to the digital amateur community, please let us know!
— Editor —

(cont'd from page 10)

The other thing that is probably as entertaining as useful is the built-in comparison the program generates. The three comparisons made are the Gettysburg Address, a Hemingway short-story, and an insurance policy. The manual is very good and explains that Lincoln used many Anglo-Saxon words and avoided Latin derivatives. Hemingway was the master of short sentences and because of that gains a high readability grade.

I've tested several things and generally I'm between Lincoln and Hemingway. Not a bad place to be! Table 1 shows a summary of statistics generated on the fiction section at the beginning of this article.

GRAMMATIK III is a good illustration of using a knowlege base to program a computer.

WHERE TO LOOK...

If you are new to Amateur Radio but experienced with computers, you are probably one of a large group. Fortunately, the combination has been around for a while and there is plenty available to you on Compuserve. The HamNet Special Interest Group (SIG) contains not only information about radio, but a good collection of current public domain software. This includes BBS programs, terminal programs, satellite tracking aids, and many utilities.

In addition, bulletins and newsletters keep you posted on the hobby. If you need an answer that you can't find locally, there are plenty of other users who can help.

The HamNet SIG covers almost every aspect of Ham Radio and is invaluable to me. It allows a constant forum for all sorts of current topics. If you own a computer, and don't use Compuserve, you are missing a good thing.

Recently, I started using BIX which is the BYTE (magazine) Information Exchange. This was prompted by my interest in a C program that I had heard was available there. It's new to me but is another option if you are looking for information.

The BIX startup kit uses a very clever technique to train new users. You can join by dialing the system. Later they send you a packet with all the BIX information and include a disk with a simulation. This was very helpful and was a good idea. By using the test program for a few minutes, I saved all the connect time it would have taken to learn the new commands.

THING WORTH KEEPING...

Summer approaches, and most of us are thinking of picnics and bugs or Field Day and bugs. A while back, I started preparing for the season by checking my portable gear to be sure it was working. Like most hams, I have a good many wires, cables and a lot of junk. Surely it is all valuable.

Part of the check out was my Tandy Model 100 computer. Very early in the personal computer age, I bought a TRS-80, to learn about computers. One day I walked into Radio Shack, for some disks, when the Model 100 was first being introduced. At that time, I had never heard of the new model and had not dreamed that anything that small could be that powerful. You guessed it. I leftuhe store that day with the Model 100 under my arm. The built-in modem introduced me to digital communication and I was soon dialing up Compuserve and the Source at 300 baud. The Model 100 traveled with me for a few years until it was replaced with a Compaq Portable. For a while it retired and gathered dust. Once I bought my first TNC, the Model 100 came back to life. I set up a portable station using a hand-held two meter rig, the TNC and the Model 100.

Over the last few years, I've seen quite a few stations operating the Mini-BBS program with just such a set-up. I rarely use it now, but the Model 100 is out for the summer and will soon be back in operation. This is a testament to how well the machine was thought out. Now there are many lap-tops, but the Model 100 still does a fine job.

What I don't understand, is why the TNC manufactures, have not come out with a very small and low power unit. Then the whole set-up would easily ride in by bicycle basket.

This year, I think I will use a combination of the Model 100, PK-232 and Ten-Tec Argonaut. It should be fun operating Amtor and RTTY with 5 watts.

Some rigs like my Argonaut and some computers like the Model 100 will probably never go out of style. They work and are reliable. Besides, when you fire them up, it brings back memories of all the good times.

GRAMMATIK III (Table 1)

```
Readability Statistics

                                     Lincoln   Hemingway   Policy

  Flesch Reading Ease:          72     64         86         45

  Gunning's Fog Index:          11

  Flesch-Kincaid Grade Level: 8        11          5         13

Paragraph Statistics

  Number of paragraphs: 8       Average length:   4.6 sentences

Sentence Statistics

  Number of sentences:  37      Average length:       17.7 words

  End with '?':         0       End with '!':         0

  Passive voice:        3       Short (< 14 words):   15

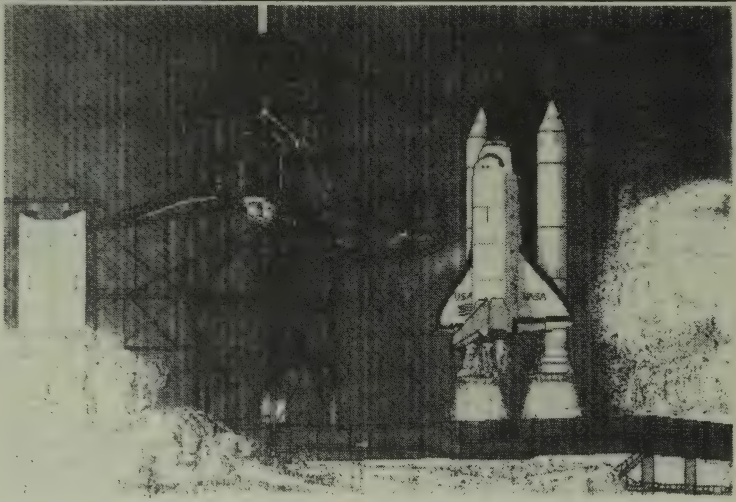
  Long  (> 30 words):   0

Word Statistics

  Number of words:      655     Prepositions:         61

  Average length:       4.35 letters

  Syllables per word:   1.38
```



Passing Picture Files Via Packet...

If you can pass text and program files via packet, why not picture files? For example, why not transmit a schematic, a QSL card, a weather map or even a digitized photograph to a friend of yours using packet radio? It's really a kind of FAX, but if you've already got a TNC, it's a lot less painful on the pocketbook.

Some of the major packet equipment manufacturers are offering new software that makes it even easier for IBM compatible owners. Kantronics offers the "PACFILE" program, which takes any "PCPAINT" format file, transmits or receives it, displays it in color and saves it to disc or printer. PAC-FILE uses about 340K of memory. It was developed by Southern Software Systems and is available from Kantronics for $29.95. It includes numerous help files and each disc is customized with the user's callsign.

MFJ is offering a similar program called "MFJXFER". This program will pass high resolution EGA color graphics screens and includes a "Picture BBS". Also included in the software are numerous file utilities and a plug-in digitizer board option that will grab images from a color video camera. Martin Jue, MFJ's President, told me that future versions of MFJXFER will also include a wordprocessor. MFJ is offering the current version for $9.95 for a limited time as a promotion.

Commodore owners are lucky to have available to 29k public domain program called Digicom‡64 (or 128) which will transmit and receive graphics files without a TNC. The computer itself becomes the packet controller with a small, inexpensive modem being the only other hardware requirement. Although Digicom, by itself, will not display the graphics file as a viewable image, there are numerous, excellent graphics programs that can do the job. Commodore compatible graphics programs are generally all available in the $25.00 range, and some are extremely sophisticated. Color video digitizers are also available for under $100. Each of these saves images as program files which are transferable on packet radio.

As with most every other aspect of computers, compatibility is a major concern when dealing with picture files. Obviously an IBM compatible generated file will not run on a Commodore or Apple computer and vice-versa. But even compatibility between programs may be a problem. We have not heard, for example, whether MFJXFER files will be displayable on PAC-FILE or vice-versa. It is likely, that due to different protocols used, some form of conversion will be required to accomplish this. It is the same with different Commodore graphics programs. Programs like "Icon Factory" of "Graphics Integrator" must be used to convert files if the transmitted file was generated by a graphics program that the receiving party does not use. Some graphics programs, like "GeoPaint" and "Flexidraw", come with conversion utilities included.

The beauty of Digicom, PAC-FILE, and MFJFXER is that program files can be saved off the air directly on to disc. Each of the programs has the capability of unattended operation as well. In other words, if I connect to a station running these programs, I can turn on the disc drive and "write" a program file directly onto it, even without the station operator being there. This eliminates the tedious task, on the receiving end, of trying to retrieve a program out of a memory buffer and converting it to a usable form.

One possible negative aspect of the "picture mode" is the size of the files. We can expect the length of a high resolution graphics file, even after compression by the program, to be quite large. If these files are sent as binary information through one or more nodes, you can imagine the log-jam it is bound to create. I have been transmitting low resolution Commodore "Doodle" files through the local node. Each file is roughly 9.25K and takes about 15 minutes to receive on the other end when the frequency is not busy. It would probably take 5 minutes or less if I sent them direct to the receiving station.

Passing graphics via packet has some exciting potential. Look for interest in this capability to increase in the coming months.

by Craig Rader, N4PLK
922 Baltimore Drive
Orlando, Florida 32810

DIGIBBS Version 3.10B...

The Netherlands has produced another "unofficial" version on the Digicom TNC emulation program. This opus is strictly a BBS program which follows the normal menu commands rather than the "//" syntax. The MYCALL parameter is protected in some way, and the authors are asking for $20.00 for a customized disc including updates and a newsletter for one year. For more information, contact: Craig Rader, N4PLK, 922 Baltimore Dr., Orlando, FL 32810 Phone: (407) 629-2965

New Merger...

Phil Anderson (W0XI), President of Kantronics, Inc. and Everett Gracy (WA6CBA), President of RFConcepts, have made the joint announcement on the merger of their two companies.

RFConcepts, Inc., well known for their production of high-quality VHF/UHF RF amplifiers, merged, and officially became a subsidiary of Kantronics, Inc. in January of this year. According to Phil Anderson, the RFConcepts name and logo will remain on all future production units.

The two principals of RFConcepts, Inc. Everett Gracy and Ken Holladay will remain with the company. Everett will continue to oversee sales for the RFC Division of Kantronics from the West Coast, and Ken will oversee engineering and production, from Kantronics' headquarters in Lawrence, Kansas.

(cont'd from page 8)

A SYSTEM FOR TIME DISPLAY

I have plans to create a CHU time decoder, if I could just set aside a few weeks to get the firmware in order. In the New Jersey area CHU comes bombing in on 7335 kHz during the day and 3330 kHz during the evening. I will probably choose 3330 kHz since it's subject to less interference. I plan to use an old CB transceiver, picked up for $5 at a flea market for the receiver. A crystal controlled converter will be used to up-convert the 3330 kHz signal to 27 MHz. Five bucks is pretty cheap for an up-converting IF AM receiver. The converter will probably come to $20 with the most expensive part being the crystal used in the oscillator.

A simple single chip microcomputer, like a 8748 or 8749, could be used to decode the data signals. Although this part doesn't have a UART built into it, a UART could be created by simply bitbanging one of the parallel input ports. That could be connected to a single chip modem that's compatible with the Bell 113 system (the old 300 bps full duplex FSK system used on phone lines before 1200 bps became so inexpensive). Display would be on standard 0.3 inch high 7 segment LED displays.

APPLICATIONS

Some might think that this is a lot of effort to go through to get time of day information. However, there are some really neat things that could be done, if you know the time pretty accurately.

Mailbox systems could scan several channels on several HF bands looking for calls. It could scan a set of twelve channels and check each channel once a minute (i.e., go to a new channel every 5 seconds). Without accurate knowledge of time a calling station would need to pick the best channel based on propagation and call, perhaps using AMTOR ARQ, for at least a minute, hopeing to "synch up" when the mailbox happed to check the calling channel. But if both stations knew the time of day to within 0.1 seconds, well then, the system could change much for the better. The mailbox might check channel 1 on 80 meters during 0-4 seconds of each minute and channel 2 on 40 meters during 5-9 seconds, etc. The calling station would know exactly where the mailbox was and could jump in tandem when the mailboxs changed channels. Of course, the channel jumping would stop when the mailbox responded and the calling station would skip a channel if the operator heard that it was in use.

Another example might be to get spread spectrum signals "close" to synchronization. Although it couldn't be used to acheive complete synch, a time receiver could be used to get the time close enough to allow the spread spectrum receiver to hunt down the bit timing very quickly, since it was given a good hint via the time information.

There are probably even more examples of where automated knowledge of time of day could be advantageous for communications.

Well, that's all for now. Please feel free to drop me a note with any suggestions you might have for future columns.

NOTES:

(1) Paul Newland, AD7I, "A Selective Calling Decoder for MF/HF Radio Systems", QEX, April 1989, pp. 310.

(2) Paul Newland, "MF/HF Selective Calling", Presented at the April 1989 Seattle Assembly Meeting of the Radio Technical Commission for Maritime Services. Reprint available from the author - send a 9 x 12 inch SASE with 65 cents postage attached.

(3) A. G. Mungall, "Canada's Time Service", paper by National Research Council Canada

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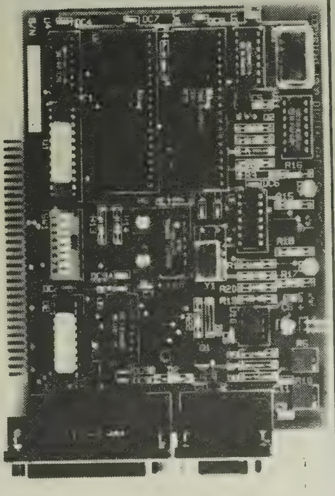

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2065 Range Road
Clearwater, FL 34625
ORDERS: 1-800-999-0204

Digital Digest COMPUTERS

by **Jonathan L. Mayo, KR3T**
3908 Short Hill Drive • Allentown, PA 18104

★ CodeMaster 100 ★

My Model 100 portable computer accompanies me most everywhere. I use it for telecommunications, word processing, scheduling, and many other tasks. But, like most other computer users, I like to keep a few "fun" programs in memory to help break the monotony during a long trip or work session. One such program is CodeMaster 100. CodeMaster 100 is designed to send random Morse code groups at a user defined speed using the computer's built-in tone generator.

I wrote the program in BASIC on the TRS-80 Model 100 portable computer, and it should easily fit in a minimal 8K system. CodeMaster 100 should also run without any trouble on any of the Kyocera compatibles.

DESCRIPTION

When run, the program first presents a title screen for a few seconds. Then the status screen is presented. The status screen is the central hub of the program and all options are selected from here. Function keys are used to select the options which include setting the sending rate (in WPM), generating and sending the random code, displaying a help screen, and returning to the Model 100's main menu. Each of the options is indicated by a keyword located over the appropriate function key label.

To activate an option, simply press the corresponding function key. A new screen display will appear, and if any new information is needed, a question prompt will also appear.

For example, to set the speed at which the code is to be sent, the first function key, labeled "Sped", would be pressed. A new screen display will appear along with a prompt asking for the speed in Words Per Minute between 1 and 60 WPM. Any input which does not meet these requirements will be rejected and the prompt will re-appear. Once a proper response is received, the program will return to the status screen, where the new speed will be displayed.

To generate and send Morse code, the fourth function key, labeled "Send", would be pressed. The computer will then generate the random code groups. Its progress can be observed from the number of period characters displayed on the screen. One period is displayed as each character is generated. There are a total of 150 characters to be randomly generated, so the process can take several seconds. However, it can be aborted by pressing the ENTER key at any time, and the program will return to the status screen.

Once the 150 characters are generated, the code is sent at the specified speed in five letter "words". Each character is displayed on the screen as it is sent, and when 30 "words" have been sent, the program halts until the ENTER key is pressed so that you may check your copy against the screen. When the ENTER key is pressed, the program will return once again to the status screen.

Pressing function key number five, labeled "Help", will cause the program to display the help screen. The help screen contains brief instructions on how to use the program. Pressing the ENTER key will return you to the status screen.

To return to the main menu and end the program, press function key eight, labeled "Menu". The program will be ended and the computer's main menu will be displayed.

PROGRAMMING

The listing of CodeMaster 100 is shown in Listing 1. You are free to enter the program into your computer as long as the remarks in the beginning of the program are maintained. All of the display screens contain graphic characters specific to the Model 100. When printed on my Epson, they are represented by lowercase characters. A conversion table is shown in Table 1 which should be consulted when entering these characters.

- TABLE 1 -

Lowercase Character	Model 100 Graphic Charcter
p	SHFT-GRPH-U
q	SHFT-GRPH-P
r	SHFT-GRPH-O
u	SHFT-GRPH-:
v	SHFT-GRPH-M
w	SHFT-GRPH->

To enter the character on the Model 100, hold down the 'Shift' and 'GRPH' keys and press the appropriate character's key.

Any BASIC commands which you do not fully understand can be looked up in you owner's manual.

Line 100 turns off the function key labels and calls a ROM routine which stops the screen from scrolling. Lines 110 through 180 print the title screen. Lined 190 is a time delay which determines how long the title screen is displayed. The For/Next values may be changed to suit your preference.

Line 200 dimensions the subscripted arrays which will hold the Morse code characters. Line 210 reads the characters and the corresponding code strings from the data statements in lines 220, 230, 240, and 250.

Line 300 sets the default code speed to 10 Words Per Minute. This value may also be changed to suit your preference. Line 310 clears the screen and assigns the new function key labels. Lines 320 through 380 clear the screen again, turn the function key labels back on, and print the status screen. Lines 390 and 395 loop until one of the labeled function keys is pressed. The program then passes to different subroutines depending on which function key has been pressed.

If function key one, "Sped", is pressed, the program will go to line 400 and continue from there. Line 400 turns off the function key labels. Lines 410 through 457 print the current speed. Line 460 presents the prompt for the new speed, and lines 470 and 480 check to make sure the input is valid. Line 490 assigns the new speed and returns to the status screen.

If function key five, "Help", is pressed, the program will go to line 500. Lines 500 through 580 turn off the function key labels, clear the screen, and print the help screen. Line 590 waits for the ENTER key to be pressed which will cause the program to return to the status screen.

If function key four, "Send", is pressed, the program will go to line 600. Lines 600 through 830 generate and send the random Morse code characters. Lines 600 and 610 clear the screen and print the "generating code" message. Line 620 computes length of a single element of Morse code at the set speed. Lines 630 through 700 generate the random characters.

Since the random function in the Model 100 follows a predictable pattern, lines 640 through 670 were implemented. The built-in time clock is used to reset the random number generator.

Line 680 generates a random number between 1 and 40 inclusive which corresponds to one of the 40 Morse code characters the program has assigned. Line 690 stores each number in a sub-

(cont'd next page)

(cont'd from previous page)

scripted variable. Line 695 checks to see if the ENTER key (or any other key) has been pressed. If the ENTER key was pressed, the program returns to line 320.

Lines 705 and 707 clear the screen and print the heading for sending the code. Lines 720 through 800 recall the random numbers and control the sending of the code. Z% is the counter which keeps track of the number of characters sent. They are sent in groups of 5. There are 6 groups per line and a total of 5 lines for a total of 150 characters. Line 750 points to the next character's number, and line 760 assigns the next character's number to N. The program then goes to a subroutine at 900 where the code is actually sent.

Line 900 assigns the string of "-"s and "."s associated with each character number to B$. Line 910 prints the actual character to the screen. Each character of B$ is then checked. If the character is a "-" then the tone generator is sounded for three time elements, and if it is a "." the tone generator is sounded for one time element. Line 970 puts a space after each character, and line 980 returns the program to line 770.

Once all 150 characters have been sent, the program goes to line 810 where the "code sent' message is printed. Line 820 and 830 wait for the ENTER key to be pressed before returning to the status screen.

Lines 1000 through 1040 are called when the "Menu" option is selected from the status screen. They return all the function keys to their default values and turn the screen scroll back on. Line 1040 then returns to the Model 100's main menu.

OPERATION

Once the program is saved in memory, it can be run at anytime. Just position the cursor over the program name in the main menu and press the ENTER key. The title screen will be displayed for a few seconds, and then the status screen will appear.

The tone generator will produce an added power load, so use the AC adaptor or other power source whenever possible to conserve the batteries.

Keep in mind that this program uses only 40 of the most common Morse code characters. If you desire, additional characters may be added. To do so, you must add them to the data statements, change the subscripted variable dimensions, change the For/Next values when reading the data, and increase the random number generator by the number of characters you have added.

CONCLUSION...

I hope you find this program fun to use. It is a great way to practice the code without bothering with cassette tapes and players, radios, and other traditional methods of code practice. If you have any questions or comments, feel free to write, and if you would like a reply, please enclose a SASE.

★ CodeMaster 100 Program ★

```
10 REM Codemaster 100

20 REM copyright 1985 by Jonathan L. Mayo KR3T

30 REM 3908 Short Hill Drive

40 REM Allentown, PA 18104

50 REM

100 SCREEN 0,0:CALL 16959

110 CLS:PRINT"pqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqr";

120 PRINT"u                                      u";

130 PRINT"u            CodeMaster 100            u";

140 PRINT"u                                      u";

150 PRINT"u                                      u";

160 PRINT"u  Copr. 1985  Jonathan L. Mayo  KR3T  u";

170 PRINT"u                                      u";

180 PRINT"vqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqw";

190 FOR Y%=1 TO 1000:NEXT Y%

200 DIM A$(40),C$(40),R(150)

210 FOR X%=1 TO 40:READ A$(X%),C$(X%):NEXT X%

220 DATA "A",".-", "B","-...", "C","-.-.", "D","-..", "E",".",

"F","..-.", "G","--.", "H","....", "I","..", "J",".---"

230 DATA "K","-.-", "L",".-..", "M","--", "N","-.", "O","---",

"P",".--.", "Q","--.-", "R",".-.", "S","...", "T","-"

240 DATA "U","..-", "V","...-", "W",".--", "X","-..-",

"Y","-.--", "Z","--..", "0","-----", "1",".----", "2","..---",

"3","...--"

250 DATA "4","....-", "5",".....", "6","-....", "7","--...",

"8","---..", "9","----.", ".",".-.-.-", ",","--..--",

"-","-...-", "?","..--.."

300 S=10

310 CLS:KEY 1,"Sped":KEY 2,"    ":KEY 3,"    ":KEY4,"Send":KEY

5,"Help":KEY 8,"Menu"

320 CLS:SCREEN 0,1:PRINT"pqqqqqqqqqqqCodeMaster
```

(cont'd on page 20)

★ **CodeMaster 100 Program** ★ *(cont'd from page 19)*

```
100qqqqqqqqqqqqr";
330 PRINT"u                                      u";
340 PRINT"u                                      u";
350 PRINT"u            Speed = ";
355 PRINT USING "##";S;
357 PRINT" WPM            u";
360 PRINT"u                                      u";
370 PRINT"u                                      u";
380 PRINT"vqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqw"
390 KEY ON:ON KEY GOSUB 400,,,600,500,,,1000
395 GOTO 390
400 SCREEN 0,0
410 CLS:PRINT"pqqqqqqqqqqqqCodeMaster 100qqqqqqqqqqqqr";
420 PRINT"u                                      u";
430 PRINT"u    Current Speed = ";
440 PRINT USING "##";S;
450 PRINT" WPM            u";
455 PRINT"u                                      u";
457 PRINT"vqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqw";
460 N$="":PRINT:LINE INPUT "      Enter new speed (WPM): ";N$
465 IF N$="" THEN 320
470 IF LEN(N$)=1 THEN N$="0"+N$
480 T1%=ASC(LEFT$(N$,1)):T2%=ASC(RIGHT$(N$,1)):IF (LEN(N$)<>2)
OR (T1%<48) OR (T2%<48) OR (T1%>57) OR (T2%>57) OR VAL(N$)<=0 OR
VAL(N$)>60 THEN BEEP: GOTO 400
490 S=VAL(N$):GOTO 320
500 SCREEN 0,0
510 CLS:PRINT"pqqqqqqqqqqqqCodeMaster 100qqqqqqqqqqqqr";
520 PRINT"u   This program generates and sends   u";
525 PRINT"u random Morse code at any speed       u";
530 PRINT"u between 1 and 60 WPM.  To set the    u";
540 PRINT"u speed, press F1.  To generate and    u";
550 PRINT"u send the code, press F4.  Have fun!  u";
570 PRINT"vqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqw";
580 PRINT"       Press <ENTER> to continue";
590 N$=INKEY$:IF N$="" THEN 590 ELSE 320
600 SCREEN 0,0:CLS:PRINT:PRINT:PRINTTAB(12);"Generating Code"
610 PRINTTAB(9);"Press <ENTER> to stop"
620 Q=(60/S)
630 FOR X%=1 TO 150:PRINT".";
640 A=VAL(RIGHT$(TIME$,2))
650 FOR I%=1 TO A
660 D=RND(1)
670 NEXT I%
680 D=INT((RND(1)*39)+1)
690 R(X%)=D
695 I$=INKEY$:IF I$<>"" THEN 320
700 NEXT X%
705 CLS:PRINTTAB(2);"Sending Code - Press <ENTER> to stop"
707 PRINT"qqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq";
710 Z%=0
720 FOR T%=1 TO 5
725 PRINT"  ";
730 FOR X%=1 TO 6
740 FOR Y%=1 TO 5
750 Z%=Z%+1
755 I$=INKEY$:IF I$<>"" THEN 810
760 N=R(Z%):GOSUB 900
770 NEXT Y%
780 SOUND 0,(5*Q):PRINT " ";
790 NEXT X%
795 PRINT"  ";
800 PRINT;:NEXT T%
810 PRINT@2,"              Code Sent
820 PRINT@288,"Press <ENTER> to continue";
830 I$=INKEY$:IF I$<>"" THEN 320 ELSE 830
900 B$=C$(N)
910 L=LEN(B$):PRINT A$(N);
920 FOR K%=1 TO L
930 IF MID$(B$,K%,1)="=" THEN W=3*Q
940 IF MID$(B$,K%,1)="," THEN W=Q
950 SOUND 2200,W
960 NEXT K%
970 SOUND 0,(3*Q)
980 RETURN
1000 CLS:SCREEN 0,0
1010 CALL 16964
1020 CALL 23164,0,23366
1030 CALL 27795
1040 MENU
```

TexNet Version 1.4 Source Code Released...

The Texas Packet Radio Society has released Version 1.4 of the TexNet system source code. This version will assemble without editing under Microsoft's M80 Version 3.44. The features incorporated into the source code of this version include all of those announced for the EPROM image of version 1.2. They are calling CQ, multiple Packet Message Servers, multiple Weather Information Servers, automatic user routing to network default service nodes and an improved node statistics display. The code may be downloaded from CompuServe's HamNet (data library "DL9").

Submitted by Bill Wade, WD5HJP
via CompuServe's HamNet
Source: - Gateway -

LAN-LINK 1.52...

is a new Personal Ham Radio Terminal Program designed to run on the IBM PC (and clones). The program provides a window into the Local Area Network (LAN) for the PK-232, KAM, TNC-1 and TNC-2. It uses "user friendly" menus and function keys to communicate... eliminating much of the time and frustration of adjusting TNC parameters. Here is an example of the features built into the program:

- Capable of recognizing your call in a Packet BBS "Mail" beacon, automatically connecting and downloading your messages.
- Capable of automatically requesting bulletins from the packet BBS on subjects that interest you.
- Conference mode in multi-connect situations.
- Split screen operation for incoming and outgoing text as well as terminal status information.
- Menu and function key driven.
- Alert signal to let you know when a predetermined call shows up in a packet header on frequency.
- Automatic capture-to-disk recording of all packet radio connects. Automatic indication of number of Packet connects.
- Smart Packet Mode Printer control turns off at disconnect.
- Indicator that a specific station designated as the "target" call connected while you were away.
- Automatic NET/ROM and KA-Node path set up from LAN-LINK.DIR call/path directory file.
- Local Area Network (LAN) message store and forward.
- Capable of automatic connect attempts to download a message from another LAN-LINK station in the LAN.
- Path determination to DX station.
- Will call CQ repetitively and either work the connect and keep going after disconnect or signal you when a reply is received.
- Automatic optimized configuration of the PK-232, KAM or TNC for each communication mode.
- Function key "OVER" feature.
- AMTOR/PACKET MSO and Selective Automatic Answering Machine capability with display of message queue.
- Automatic Beacon Mode CQ caller in Packet and AMTOR communication modes.
- Automatic logbook entries for Packet and Beacon mode AMTOR connects, semi-automatic logbook entries for other modes.
- Automatic TNC parameter configuration for HF and VHF packet.
- Automatic CQ caller. Will call CQ repetitively and signal you when a reply is received.
- RTTY SELCAL.
- RTTY Navy MARS File Transfer Protocols (PK-232 only).
- Contest operation, sends standard message and automatically increment QSO count.
- Single keystroke set-up to receive UOSAT-OSCAR 9 and Phase 3 RTTY Telemetry (PK-232 only).
- 10 File buffers for custom messages which can be viewed on-line.
- Log file is compatible to that of the G3ZCZ CONTEST program can be processed by G3ZCZ DBASE Logbook Package of PC-HAM for indexed listings, tracking of DXCC and other AWARDS, etc.

All this and more is available on LAN-LINK which is designed to maximize your AMTOR and packet enjoyment yet cut down on the amount of time to spend connected to a BBS.

LAN-LINK is being distributed as Shareware in which the user can try it out before registering his/her copy. Registered copies which entitle the owner to upgrades and full support are available from the author at $35.00. Users of earlier versions of LAN-LINK and of PK232COM Version 1.48 may upgrade by sending in a blank formatted disk and SASE.

LAN-LINK is written, maintained and upgraded by Joe Kasser, G3ZCZ, who is author of numerous magazine articles and two books about Microcomputers and Amateur Radio.

The Packet Radio Handbook 2nd Edition...

has just rolled off the presses!

Like any other high-tech field, the world of amateur radio is advancing rapidly. Packet radio, the most capable form of digital communications available to radio amateurs, is a perfect example of growth in the field because it provides access to stations worldwide via a microcomputer. To keep pace with changes in packet radio technology, Jonathan Mayo, KR3T has now updated this popular handbook.

For beginning and experienced hams alike, the book serves as a good overview of packet, its history, its capabilities, and its limitations. Jon covers all the technical aspects of the hobby, including how to set up and operate a station, and describes the latest enhancements in terminal node and multimode digital controllers, high-speed modems, and networking systems.

In addition to being a regular columnist for Digital Digest, Jon has published many books and articles on computers and digital communications. His latest edition of "The Packet Radio Handbook" is published by TAB Books, and is priced at $15.95. For additional information, please contact:
Lea Ann Browning at TAB Books,
Phone: (717) 794-2191

New ROSE Switch and Server Released...

The Radio Amateur Telecommunications Society (RATS) has released version 330 (for March 30) of Tom Moulton's (W2VY) ROSE X.25 Packet Switch and Brian Riley's (KA2BQE) ROSErver/PRMBS software.

The switch software runs in a TNC 2 (or clone) or a PacComm DR-200. It supports back-to-back TNC configuration. The new version of the software has several minor bug fixes and has been in operation on eight switches in New Jersey for several weeks without problem. The server software runs on any MS-DOS/PC-DOS compatible computer and provides many handy user and SYSOP functions that are unique to PBBSs.

The software may be downloaded from CompuServe's HamNet (data library "DL9") or from The RATS BBS at 201-387-8898. Log on as "rats" ("rats" must be entered in lowercase) and a menu will appear listing current files followed by a prompt for your name, etc., and then the file name. The file transfer is available using XMODEM only.

The code may also be obtained by sending $15.00 (US funds) to:

The Radio Amateur Telecommunications Society (RATS)
206 North Vivyen Street
Bergenfield, NJ 07621

Submitted by J. Gordon Beattie, Jr., N2DSY via CompuServe's HamNet

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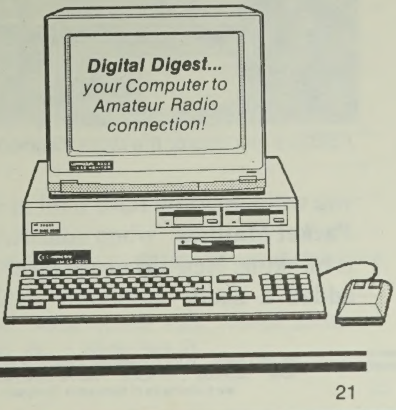
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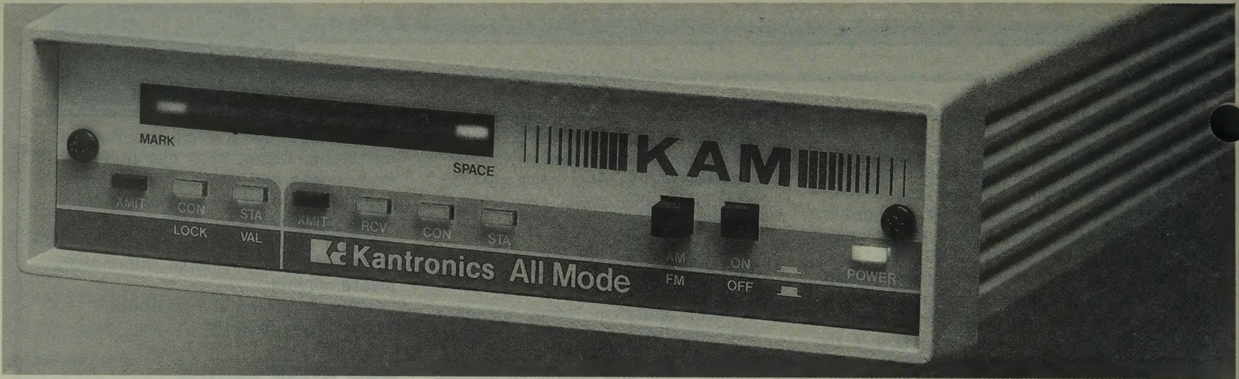

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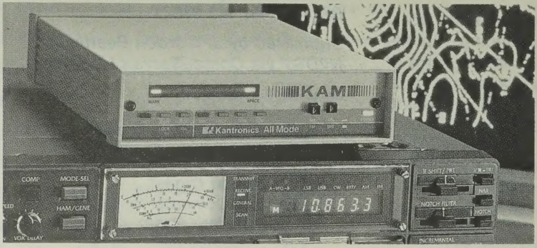

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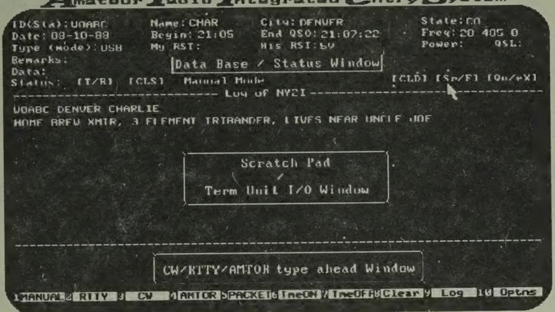

```
ID(Sta):UOABC      Name:CHAR       City:DENVER          State:CO
Date:08-10-88      Begin:21:05     End QSO:21:07:22     Freq:20 405 0
Type (mode):USB    My RST:         His RST:59           Power:     QSL:
Remarks:
Data:                   Data Base / Status Window
Status:  [T/R]  [CLS]   Manual Mode              [CLD] [Sr/F] [Qu/eX]
--------------------------- Log of NY2I --------------------------------
UOABC DENVER CHARLIE
HOME BREW XMTR, 3 ELEMENT TRIBANDER, LIVES NEAR UNCLE JOE

                         Scratch Pad
                              /
                     Term Unit I/O Window

-------------------------------------------------------------------------
                 CW/RTTY/AMTOR type ahead Window
1MANUAL 2 RTTY 3  CW  4AMTOR 5PACKET 6TneON 7TneOFF 8Clear 9 Log 10 Optns
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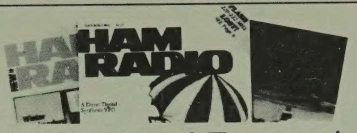

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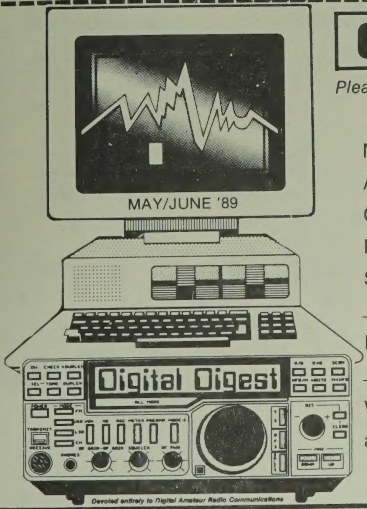
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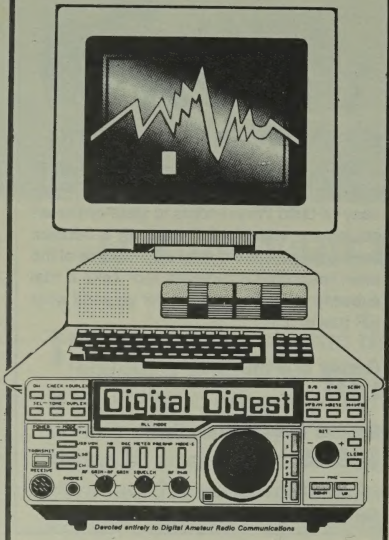
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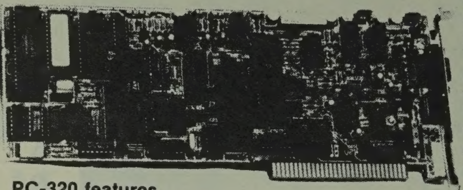

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